

What is claimed is:

1     1.     A system for interactively monitoring and adjusting product output from the individual  
2     tool of a module, wherein the output is a result of the coordinated effort of two or more  
3     semiconductor preparation tools making up the module, the system comprising;  
4             a first tool of said two or more semiconductor tools, said first tool capable of  
5     implementing a first process on a semiconductor product and producing a first output;  
6             a second tool of said two or more semiconductor tools, said second tool receiving as input  
7     said first output from said first tool , and said second tool capable of implementing a second  
8     process on the semiconductor product and producing a second output,  
9             wherein said first tool measures and obtains measurement data relating to the  
10    thickness and uniformity of a film, and wherein said measurement data is conveyed to said  
11    second tool for use in modifying a behavior of said second tool; and  
12             a module control mechanism, said module control mechanism capable of  
13    facilitating the exchange of information between said first tool and said second tool so that the  
14    module yields a desired semiconductor product output, said semiconductor product output being,  
15    or resulting from, said second output.

1     2.     The system of claim 1 wherein the said first tool includes a metrology station and said  
2     second tool includes a chemical mechanical polishing apparatus.

1     3.     The system of claim 2, wherein modifying the behavior of said second tool includes  
2     determining a plurality of pressures to apply to different regions of the semiconductor product as  
3     it is pressed against a polishing surface.

1 4. The system of claim 1, wherein said module control mechanism is a part of said first tool,  
2 or is distributed between said first and second tools.

1 5. A system for controlling the quality and/or quantity of a final semiconductor product  
2 output from a multi-function tool, wherein the final semiconductor output is a result of the  
3 coordinated effort of two or more functional units making up the multi function tool, the system  
4 comprising;

5 a first functional unit of said two or more functional units, said first functional unit  
6 capable of implementing a first process on a semiconductor product and producing a first output,  
7 wherein said first functional unit measures and obtains measurement data relating to the  
8 thickness and/ or uniformity of a film;

9 a second functional unit of said two or more semiconductor functional units, said second  
10 tool receiving as input said first output from said first functional unit, and said second functional  
11 unit capable of implementing a second process on the semiconductor product and producing a  
12 second output,

13 wherein said measurement data from the first functional unit is conveyed to said  
14 second functional unit for use in modifying a behavior of said second functional unit; and

15 a module control mechanism, said module control mechanism capable of facilitating the  
16 exchange of information between said first functional unit and said second functional unit so that  
17 the multi-function tool yields a pre-set or user-specified final semiconductor product output,  
18 said semiconductor product output being, or resulting from, said second output.

1 6. The system of claim 5 wherein the said first functional unit includes a metrology station  
2 and said second functional unit includes a chemical mechanical polishing apparatus.

1 7. The system of claim 6, wherein modifying the behavior of said second functional unit  
2 includes determining a plurality of pressures to apply to different regions of the semiconductor  
3 product.

1 8. A method for associating information with a wafer in a semiconductor processing  
2 facility, comprising the steps of:

3 (1) processing a wafer at a first wafer processing tool, and storing first information  
4 pertaining to said wafer on a traveling information file,

5 wherein said traveling information file comprises information pertaining  
6 to the status of said wafer;

7 (2) transferring said wafer to a second wafer processing tool;

8 (3) transferring said traveling information file with said wafer to said second wafer  
9 processing tool;

10 (4) receipt of said traveling information file by said second wafer processing tool; and

11 (5) processing said wafer at said second processing tool using said first information in  
12 said wafer status file, and storing second information pertaining to said wafer on said traveling  
13 information file.

1 9. A system for controlling the quality and/or quantity of a final semiconductor product  
2 output from a module, wherein the final semiconductor output is a result of the coordinated effort  
3 of two or more semiconductor preparation tools making up the module, the system comprising;  
4 a first tool of said two or more semiconductor tools, said first tool capable of  
5 implementing a first process on a semiconductor product and producing a first output;

6 a second tool of said two or more semiconductor tools, said second tool receiving as input  
7 said first output from said first tool, and said second tool capable of implementing a second  
8 process on the semiconductor product and producing a second output,

9 wherein said first tool measures and obtains measurement data relating to the  
10 thickness and uniformity of a film, and wherein said measurement data is conveyed to said  
11 second tool for use in modifying a behavior of said second tool; and

12 a module control mechanism, said module control mechanism capable of facilitating the  
13 exchange of information between said first tool and said second tool so that the module yields a  
14 pre-set or user-specified final semiconductor product output, said final semiconductor product  
15 output being, or resulting from, said second output.

1 10. The system of claim 9 wherein the said first tool includes a metrology station and said  
2 second tool includes a chemical mechanical polishing apparatus.

1 11. The system of claim 10, wherein modifying the behavior of said second tool includes  
2 determining a plurality of pressures to apply to different regions of the semiconductor product as  
3 it is pressed against a polishing surface.

1 12. The system of claim 9, wherein said module control mechanism is a part of said first tool,  
2 or is distributed between said first and second tools.

1 13. A system for interactively monitoring and adjusting product output from a module,  
2 wherein the output is a result of the coordinated effort of two or more semiconductor tools  
3 making up the module, the system comprising:

4 a first tool of said two or more semiconductor tools, said first tool capable of  
5 implementing a first process on a semiconductor product and producing a first output;

6 a second tool of said two or more semiconductor tools, said second tool receiving as input  
7 said first output from said first tool, and said second tool capable of implementing a second  
8 process on the semiconductor product and producing a second output,

9 wherein one of said first or second tools measures and obtains measurement data relating  
10 to said semiconductor product, and wherein said measurement data is conveyed to the other of  
11 said first or second tools for use in modifying a behavior of said other of said first or second tool;  
12 and

13 a module communication mechanism, said module communication mechanism capable of  
14 facilitating the communication of information between said first tool and said second tool so that  
15 the module yields a desired semiconductor product output,

16 said semiconductor product output being, or resulting from, said second output.

1 14. The system of claim 13, wherein said first tool includes a deposition function, and said  
2 second tool includes a CMP function.

1 15. The system of claim 13, wherein said first tool includes a deposition function, and said  
2 second tool includes an etch function.

1 16. The system of claim 13, wherein said first tool includes a CMP function, and said second  
2 tool includes an etch function.

1 17. The system of claim 13, wherein said first tool includes an electroplating function, and  
2 said second tool includes a CMP function.

1 18. The system of claim 13, wherein said first tool includes a sputtering function, and said  
2 second tool includes an electroplating function.

1 19. The system of claim 13, wherein said first tool includes an etch function, and said second  
2 tool includes an inspection function for inspecting the results of said etch function.

1 20. The system of claim 13, wherein said measurement data relates to the thickness and/or  
2 uniformity of a film.

1 21. The system of claim 13, further comprising a module controller, wherein at least some  
2 information communicated by said module communication mechanism are controlled by said  
3 module controller.

1 22. The system of claim 21, wherein said module communication mechanism resides, at least  
2 in part, in either said first or second tool, or is distributed between said first and second tools.

1 23. The system of claim 13, wherein said module communication mechanism resides, at least  
2 in part, in either said first or second tool, or is distributed between said first and second tools.

1 24. A system for interactively monitoring and adjusting product output from a multi-function  
2 tool, wherein the output is a result of the coordinated effort of two or more functional units  
3 making up the multi-function tool, the system comprising:

4 a first functional unit of said two or more semiconductor functional units, said first  
5 functional unit capable of implementing a first process on a semiconductor product and  
6 producing a first output;

7 a second functional unit of said two or more semiconductor functional units, said second  
8 functional unit receiving as input said first output from said first functional unit, and said second  
9 functional unit capable of implementing a second process distinct from said first process on the  
10 semiconductor product and producing a second output,

11            wherein one of said first or second functional units measures and obtains measurement  
12    data relating to said semiconductor product, and wherein said measurement data is conveyed to  
13    the other of said first or second functional units for use in modifying a behavior of said other of  
14    said first or second functional unit; and

15            a module communication mechanism, said module communication mechanism capable of  
16    facilitating the exchange of information between said first functional unit and said second  
17    functional unit so that the multi-function tool yields a desired semiconductor product output,  
18    said semiconductor product output being, or resulting from, said second output.

1    25.    The system of claim 24, wherein said measurement data relates to the thickness and/or  
2    uniformity of a film.

1    26.    The system of claim 24, further comprising a third functional unit, wherein the routing of  
2    a semiconductor product through said first, second and third functional units occurs in a pre-  
3    determined, fixed sequence.

1    27.    The system of claim 24, wherein said first functional unit includes a deposition function,  
2    and said second functional unit includes a CMP function.

1    28.    The system of claim 24, wherein said first functional unit includes a deposition function,  
2    and said second functional unit includes an etch function.

1    29.    The system of claim 24, wherein said first functional unit or said second functional unit  
2    includes a CMP function.

1    30.    The system of claim 24, wherein said first functional unit includes an electroplating  
2    function, and said second functional unit includes a CMP function.

1 31. The system of claim 24, wherein said first functional unit or said second functional unit  
2 includes a deposition function.

1 32. The system of claim 24, wherein said first functional unit includes an etch function, and  
2 said second functional unit includes an inspection function for inspecting the results of said etch  
3 function.

1 33. The system of claim 24, further comprising a module controller, wherein at least some  
2 information communicated by said module communication mechanism are controlled by said  
3 module controller.

1 34. The system of claim 33, wherein said module communication mechanism resides, at least  
2 in part, in either said first or second functional unit, or is distributed between said first and  
3 second functional units.

1 35. The system of claim 24, wherein said module communication mechanism resides, at least  
2 in part, in either said first or second functional unit, or is distributed between said first and  
3 second functional units.

1 36. A method for associating information with a wafer in a semiconductor processing  
2 facility, comprising the steps of:

3 (1) processing a wafer at a first wafer processing tool, and storing first information  
4 pertaining to said wafer on a wafer information entity,

5 wherein said wafer information entity comprises information pertaining to the status of  
6 said wafer;

7 (2) transferring said wafer to a second wafer processing tool;



(3) transferring said wafer information entity with said wafer to said second wafer processing tool;

(4) receiving said wafer information entity by said second wafer processing tool;

(5) processing said wafer at said second processing tool using said first information in said wafer information entity, and storing second information pertaining to said wafer on said wafer information entity.

37. A method for associating information with a wafer in a semiconductor processing facility, comprising the steps of:

(1) processing a first wafer at a first wafer processing tool, and storing first information pertaining to said first wafer on a wafer information entity,

wherein said wafer information entity comprises information pertaining to the status of said first wafer;

(2) transferring said first wafer to a second wafer processing tool;

(3) transferring said wafer information entity with said first wafer to said second wafer processing tool;

(4) receiving said wafer information entity by said second wafer processing tool;

(5) processing said first wafer at said second processing tool, and storing second information pertaining to said first wafer on said wafer information entity;

(6) transferring at least some of said second information to said first wafer processing tool;

and

15 (7) processing a second wafer at said first wafer processing tool using said at least some of  
16 said second information of said step (6).

1 38. The method of claim 37, wherein wafer information entity contains a recipe or a  
2 modification of said recipe, and wherein said first wafer processing tool comprises the step of  
3 using said recipe or said modification of said recipe in said wafer information entity to process  
4 said wafer.

1 39. A system for interactively monitoring and adjusting product output from a module,  
2 wherein the output is a result of the coordinated effort of two or more semiconductor tools  
3 making up the module, the system comprising;  
4 an electroplating tool, said electroplating tool capable of implementing a copper  
5 depositing process on a semiconductor product and producing a first output;  
6 a CMP tool, said CMP tool receiving as input said first output from said electroplating  
7 tool, and said CMP tool capable of implementing an excess material removal process on the  
8 semiconductor product and producing a second output,  
9 a module communication mechanism, said module communication mechanism capable of  
10 facilitating the exchange of information between said electroplating tool and said CMP tool so  
11 that the module yields a desired semiconductor product output,  
12 said semiconductor product output being, or resulting from, said second output.

1 40. The system of claim 39, further comprising a module controller, wherein at least some  
2 information communicated by said module communication mechanism are controlled by said  
3 module controller.

1 41. The system of claim 40, wherein said module communication mechanism resides, at least  
2 in part, in either said first or second tool, or is distributed between said first and second tools.

1 42. The system of claim 39, wherein said module communication mechanism resides, at least  
2 in part, in either of said first or second tool, or is distributed between said first and second tools.

1 43. A method for interactively monitoring and adjusting product output from a module,  
2 wherein the output is a result of the coordinated effort of two or more semiconductor tools  
3 making up the module, the method comprising the steps of:

4 (1) implementing a first process on a semiconductor product, using a first tool of said  
5 two or more semiconductor tools, to produce a first output;

6 (2) implementing a second process on the semiconductor product, using a second tool  
7 of said two or more semiconductor tools, to produce a second output, said second tool receiving  
8 as input said first output from said first tool,

9 (3) measuring and obtaining measurement data relating to said semiconductor  
10 product, by one of said first or second tools, and conveying said measurement data to the other of  
11 said first or second tools for use in modifying a behavior of said other of said first or second tool;  
12 and

13 (4) facilitating the communication of information between said first tool and said  
14 second tool so that the module yields a desired semiconductor product output,  
15 said semiconductor product output being, or resulting from, said second output.

1 44. The method of claim 43, wherein said first tool includes a deposition function, and said  
2 second tool includes a CMP function.

- 1 45. The method of claim 43, wherein said first tool includes a deposition function, and said  
2 second tool includes an etch function.
- 1 46. The method of claim 43, wherein said first tool includes a CMP function, and said second  
2 tool includes an etch function.
- 1 47. The method of claim 43, wherein said first tool includes an electroplating function, and  
2 said second tool includes a CMP function.
- 1 48. The method of claim 43, wherein said first tool includes a sputtering function, and said  
2 second tool includes an electroplating function.
- 1 49. The method of claim 43, wherein said first tool includes an etch function, and said  
2 second tool includes an inspection function for inspecting the results of said etch function.
- 1 50. The method of claim 43, wherein said measurement data relates to the thickness and/or  
2 uniformity of a film.
- 1 51. The method of claim 43, wherein at least some aspects of said step (4) are controlled by a  
2 module controller.
- 1 52. The method of claim 51, wherein at least some aspects of said step (4) are controlled by  
2 either said first or second tools, or by a combination of said first and second tools.
- 1 53. The method of claim 43, wherein at least some aspects of said step (4) are controlled by  
2 either said first or second tools, or by a combination of said first and second tools.

1 54. A method for interactively monitoring and adjusting product output from a multi-function  
2 tool, wherein the output is a result of the coordinated effort of two or more functional units  
3 making up the multi-function tool, the method comprising the steps of:

4 (1) implementing a first process on a semiconductor product, using a first functional  
5 unit of said two or more functional units, to produce a first output;

6 (2) implementing a second process on the semiconductor product, using a second  
7 functional unit of said two or more functional units, to produce a second output, said second  
8 functional unit receiving as input said first output from said first functional unit,

9 (3) measuring and obtaining measurement data relating to said semiconductor  
10 product, by one of said first or second functional units, and conveying said measurement data to  
11 the other of said first or second functional units for use in modifying a behavior of said other of  
12 said first or second functional unit; and

13 (4) facilitating the communication of information between said first functional unit  
14 and said second functional unit so that the multi-function tool yields a desired semiconductor  
15 product output,

16 said semiconductor product output being, or resulting from, said second output.

1 55. The method of claim 54, further comprising the step of implementing a third process on  
2 the semiconductor product using a third functional unit, wherein the routing of the  
3 semiconductor product through said first, second and third functional units occurs in a pre-  
4 determined, fixed sequence.

1 56. The system of claim 24, wherein said first functional unit or said second functional unit  
2 includes a sputtering function.

1 57. The system of claim 33, wherein said control is facilitated by the use of algorithmic  
2 instructions.

1 58. The system of claim 40, wherein said control is facilitated by the use of algorithmic  
2 instructions.

1 59. A system for controlling the quality and/or quantity of a final semiconductor product  
2 output from a multi-function tool, wherein the final semiconductor output is a result of the  
3 coordinated effort of two or more functional units making up the multi function tool, the system  
4 comprising;

5 a first functional unit of said two or more functional units, said first functional unit  
6 capable of implementing a first process on a semiconductor product and producing a first output,  
7 wherein said first functional unit measures and obtains measurement data relating to the  
8 thickness and/ or uniformity of a film;

9 a second functional unit of said two or more semiconductor functional units, said second  
10 tool receiving as input said first output from said first functional unit, and said second functional  
11 unit capable of implementing a second process on the semiconductor product and producing a  
12 second output,

13 wherein said measurement data from the first functional unit is conveyed to said  
14 second functional unit for use in modifying a behavior of said second functional unit; and

15 a module control mechanism, said module control mechanism capable of facilitating the  
16 exchange of information between said first functional unit and said second functional unit so that  
17 the multi-function tool yields a pre-set or user-specified final semiconductor product output,

18 said semiconductor product output being, or resulting from, said second output,

19            wherein said two or more semiconductor functional units use a unifying protocol, to  
20    thereby alleviate a need to use station controllers for said two or more functional units.